Exhibit R-2, PB 2010 Air Force RDT&E Budget Item Justification									DATE: May 2009	
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research					R-1 ITEM NOMENCLATURE PE 0602890F High Energy Laser Research					
COST ($ in Millions)	**FY 2008 Actual**	**FY 2009 Estimate**	**FY 2010 Estimate**	**FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
Total Program Element	48.588	49.268	52.754						Continuing	Continuing
625096: High Energy Laser Research	48.588	49.268	52.754						Continuing	Continuing

A. Mission Description and Budget Item Justification

This program funds Department of Defense (DoD) high energy laser (HEL) applied research through the HEL Joint Technology Office (JTO). HEL weapon systems have many potential advantages, including speed-of-light delivery, precision target engagement, significant magazine depth, low-cost per kill, and reduced logistics requirements. HELs have the potential to perform a wide variety of military missions including interception of ballistic missiles in boost phase; defeat of high-speed, maneuvering anti-ship and anti-aircraft missiles; and the ultra-precision negation of targets in urban environments with no/little collateral damage. This program is part of an overall DoD HEL Science and Technology program. In general, efforts funded under this program are chosen for their potential to have an impact on multiple HEL systems and multiple Service missions while complimenting Service/Agency programs that are directed at specific Service needs. A broad range of technologies are addressed in key areas such as chemical lasers, solid state lasers, free electron lasers, laser beam control, and laser lethality mechanisms. This program is in Budget Activity 2, Applied Research, since it develops and determines the technical feasibility and military utility of evolutionary and revolutionary technologies.

B. Program Change Summary ($ in Millions)

	FY 2008	FY 2009	FY 2010	FY 2011
Previous President's Budget	49.949	49.449	53.561	
Current BES/President's Budget	48.588	49.268	52.754	
Total Adjustments	-1.361	-0.181	0.000	
Congressional Program Reductions	0.000	-0.047		
Congressional Rescissions	0.000	-0.134		
Total Congressional Increases	0.000	0.000		
Total Reprogrammings	0.000	0.000		
SBIR/STTR Transfer	-1.361	0.000		

Change Summary Explanation

Not Applicable.

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C. Performance Metrics
Under Development.

Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602890F High Energy Laser Research					PROJECT NUMBER 625096	
COST ($ in Millions)	**FY 2008 Actual**	**FY 2009 Estimate**	**FY 2010 Estimate**	**FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
625096: High Energy Laser Research	48.588	49.268	52.754						Continuing	Continuing

A. Mission Description and Budget Item Justification

N/A

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
MAJOR THRUST: Advance solid-state laser development. In FY 2008: Directed the 100 kilowatt Joint High Power Solid State Laser (JHPSSL) project. Provided for independent government-sponsored measurements of the 100 kilowatt laser(s). Completed preliminary plan for a joint high-power electric laser product improvement program that emphasizes efficiency, affordability, and ruggedization. In FY 2009: Participate in the 100 kilowatt JHPSSL laboratory demonstrations. Verify performance through independent government-sponsored measurements. Initiate a joint-high power electric laser product improvement program that emphasizes efficiency, affordability, and ruggedization. In FY 2010: Conduct a joint-high power electric laser product improvement program. Begin translation of efficiency improvements into size, weight and packing reductions.	11.881	8.500	12.652	
MAJOR THRUST: Mature solid state laser device technologies that will provide improve system level performance. In FY 2008: Developed technologies that will lead to improved fieldability, serviceability, and ruggedness. Developed power scaling architectures that maintain good beam quality. Established a versatile testbed enabling demonstration of laser module combination concepts. Conducted an industry proposal call for FY 2008, awarded eight new projects.	8.480	9.308	9.514	

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B. Accomplishments/Planned Program ($ in Millions)		**FY 2008**	**FY 2009**	**FY 2010**	**FY 2011**
In FY 2009: Continue power scaling architecture development with good beam quality and reduced size and weight. Improve the efficiency and reliability of diode pump sources. Continue testing of laser module combination concepts on the testbed. Conduct Service and Agency proposal call for FY 2009. In FY 2010: Combine high performance single modules in optimum module combination schemes to demonstrate the path to weapons-class scaling. Continue development of high reliability diode pump sources. Investigate eye-safer laser technologies. Conduct an industry proposal call for FY 2010.					
MAJOR THRUST: Investigate new technologies that have revolutionary potential for HEL applications. In FY 2008: Explored short-pulse laser technology and potential applications. Conducted an industry proposal call for FY 2008, awarded four new projects in optical materials development and novel beam control configurations. In FY 2009: Develop materials with improved thermo-mechanical properties. Demonstrate short pulse laser technologies in a laboratory environment. Demonstrate novel beam control concepts. Investigate new laser materials for direct lasing in different wavelength regimes. Conduct a Service and Agency proposal call for FY 2009. In FY 2010: Incorporate new materials into a laser device and demonstrate properties in terms of wavelength selection, thermal handling, and overall laser efficiency. Scale short pulse laser technologies for military applications. Conduct an industry proposal call for FY 2010.		3.480	4.520	4.595	
MAJOR THRUST: Explore free electron lasers (FEL) that have potential in future HEL weapons. Conduct system level technology development and trade studies to facilitate scaling FELs to weapons-class power levels and shipboard integration.		7.777	7.210	4.265	

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B. Accomplishments/Planned Program ($ in Millions)		**FY 2008**	**FY 2009**	**FY 2010**	**FY 2011**
In FY 2008: With the Navy, investigated the development path for scaling to a 100 kilowatt laboratory demonstration. Conducted an industry proposal call for FY 2008, awarded five new projects. In FY 2009: With the Navy, complete prototype FEL demonstration activities and investigate the development path for scaling to a 100 kilowatt lab demonstration, with emphasis on technologies that can support 1 megawatt future FEL performance. Conduct a Service and Agency proposal call for FY 2009. In FY 2010: With the Navy, continue to investigate the development path for scaling to a 100 kilowatt laboratory demonstration, with emphasis on technologies that can support a megawatt class future FEL. Conduct an industry proposal call for FY 2010.					
MAJOR THRUST: Conduct technology experiments to select promising chemical generator and chemical regeneration technologies that can be scaled for weapons application. Conduct advanced research in scaling of diode-pumped alkali lasers. In FY 2008: Demonstrated closed-cycle chemical oxygen iodine laser devices. Explored novel concepts on electric-gas phase laser generation. Conducted an industry proposal call for FY 2008, awarded four new projects. In FY 2009: Investigate alternate chemical processes and high pressure operations concepts. Develop concepts for gas lasing materials with high efficiency. Investigate power scaling potential of direct excitation gas lasers. Conduct a Service and Agency proposal call for FY 2009. In FY 2010: Demonstrate efficient production of chemical laser fuels. Demonstrate concepts on electric-gas phase laser generation. Conduct an industry proposal call for FY 2010.		5.220	6.160	6.146	
MAJOR THRUST: Develop technology to support high performance beam control systems and integrated demonstrations.		7.750	9.490	9.662	

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
In FY 2008: Explored advanced component and control techniques for difficult environments, such as high speed flight, high turbulence, and extended ranges. Conducted an industry proposal call for FY 2008, awarded eight new projects. In FY 2009: Develop/provide beam control technology options for laser weapon use on multiple platforms (aircraft, ground vehicles and shipboard systems). Investigate technologies to compensate for negative effects of atmosphere and platform vibration. Conduct a Service and Agency proposal call for FY 2009. In FY 2010: Demonstrate efficient production of chemical laser fuels. Demonstrate concepts on electric-gas phase laser generation. Conduct an industry proposal call for FY 2010.				
MAJOR THRUST: Develop a lethality database, and integrate into a systems-level architecture plan and lethality models. In FY 2008: Integrated lethality data into campaign-level HEL system models. Conducted laser vulnerability experiments on materials, components, and targets. Developed laser systems inputs for the Joint Munitions Effect Manual. In FY 2009: Develop databases that will be accepted by the HEL community, and integrate in validated models for laser systems designers. Conduct laser vulnerability experiments on materials, components, and targets. Update laser systems inputs for the Joint Munitions Effect Manual. In FY 2010: Integrate lethality data into campaign-level HEL system models. Conduct laser vulnerability experiments on materials, components, and targets. Update laser systems inputs for the Joint Munitions Effect Manual.	4.000	4.080	4.068	
	0.000	0.000	1.852	

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
MAJOR THRUST: Maintain and evaluate high-fidelity engineering models for HEL system scenario evaluation and incorporation into the HEL toolkit. Provide for HEL system modeling for into mission-level wargaming activities. Note: In FY 2010, this effort transitions from PE 0601108F, High Energy Laser Research Initiatives to this PE. In FY 2008: Not Applicable. In FY 2009: Not Applicable. In FY 2010: Complete, test and demonstrate solid state laser model. Complete HEL system scenario model and demonstrate engagement applications.				

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APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602890F High Energy Laser Research	PROJECT NUMBER 625096

C. Other Program Funding Summary ($ in Millions)

	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
PE 0601108F/ High Energy Laser Research Initiatives.	0.000	0.000							Continuing	Continuing
PE 0603444F/ Maui Space Surveillance System.	0.000	0.000							Continuing	Continuing
PE 0603605F/ Advanced Weapons Technology.	0.000	0.000							Continuing	Continuing
PE 0603924F/ High Energy Laser Advanced Technology Program.	0.000	0.000							Continuing	Continuing
PE 0603883C/ Ballistic Missile Defense Boost Phase Segment.	0.000	0.000							Continuing	Continuing
PE 0602605F/ Directed Energy Technology.	0.000	0.000							Continuing	Continuing
PE 0602307A/ Advanced Weapons Technology.	0.000	0.000							Continuing	Continuing
PE 0602114N/ Power Projection Applied Research.	0.000	0.000							Continuing	Continuing
PE 0602120A/ Sensors and Electronic Survivability.	0.000	0.000							Continuing	Continuing
PE 0603004A/ Weapons and Munitions Advanced Technology.	0.000	0.000							Continuing	Continuing
PE 0602702E/ Tactical Technology.	0.000	0.000							Continuing	Continuing

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PE 0603175C/ Ballistic Missile Defense Technology.	0.000	0.000		Continuing	Continuing
PE 0602651M/ Joint Non-Lethal Weapons Applied Research.	0.000	0.000		Continuing	Continuing
PE 0603651M/ Joint Non-Lethal Weapons Technology Development.	0.000	0.000		Continuing	Continuing
Activity Not Provided/ This project has been coordinated through the Reliance process to harmonize efforts and eliminate du	0.000	0.000		Continuing	Continuing

D. Acquisition Strategy

Not Applicable.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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